



## 2022 Scotts Bluff County Fair 4-H Fair Book



### Science, Engineering & Technology

**Only one entry per class.** <sup>S<sub>E</sub></sup> Classes only are State Fair eligible.

**All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.**

Large static items eligible for state fair will be the responsibility of the family to get to the Nebraska State Fair.

### Small Engines Division 890

#### Crank It Up - Unit 1

Class 3 **Small Engine Display/Item:** Show an application of one of the concepts learned in the unit project. Examples include: identify the parts of a small engine, safety rules for starting a small engine, small engine repair toll identification.

#### Warm It Up - Unit 2

Class 1 **Small Engine Display/Item:** Show an application of one of the concepts learned in the Warm It Up project. Examples include: comparison of engine oil types, transmissions, or safety related to engines. Exhibit could be a poster, or an actual item.

#### Tune It Up - Unit 3

Class 2 **Engine Display/Item:** Display/item should exemplify one of the lessons learned in the Tune It Up project. Examples include: diagnostic tools, fuel systems, ignition systems. If a complete engine is exhibited, it will not be started. However, display needs to report process of building/rebuilding engine and how/where engine will be utilized (i.e. lawn mower, weed eater, snow blower, etc.)

### SET Energy Division 900

This category provides 4-H'ers a way to present their ideas about renewable energy resources. Through participation in this category 4-H'ers will learn more about physics, friction, energy, and elasticity. In addition, participants will make a display to go along with their findings.

All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.

State Fair Premier 4-H Science Award is available in this area.

Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hphysics-powerofwind>.

#### Rules

1. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
2. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations. Results: What you learned. All reports should be computer generated and enclosed in a clear, plastic cover. The reports should be attached securely to the display.

Renewable Energy Resources:

United States Department of Energy: <https://www.energy.gov/clean-energy>

U.S Energy Information Administration: <https://www.eia.gov/energyexplained/renewable-sources/>

Natural Resources Defense Council: <https://www.nrdc.org/stories/renewable-energy-clean-facts>

<sup>S<sub>E</sub></sup>Class 1 **Create and Compare Energy Resources Poster** (Scoresheet SF307) – Poster should explore 2 alternative/renewable energy resources. Compare and contrast the 2 resources including two of the following information: amount of energy created, costs



## 2022 Scotts Bluff County Fair 4-H Fair Book



of production, usability of the energy, pros/cons of environmental impacts, etc. Posters can be any size up to 28" by 22".

- S<sub>F</sub>Class 2 Experiment Notebook** (Scoresheet SF305) – Notebook will explore the scientific method involving alternative/renewable energy sources. Information required. 1.) Hypothesis 2.) Research 3.) Experiment 4.) Measure 5.) Report or Redefine Hypothesis.
- S<sub>F</sub>Class 3 Solar as Energy Display** (Scoresheet SF308) – Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of water. Examples include solar ovens, solar panels, etc.
- S<sub>F</sub>Class 4 Water as Energy Display** (Scoresheet SF308) – Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of water.
- S<sub>F</sub>Class 5 Wind as Energy Display** (Scoresheet SF308) – Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of wind.
- S<sub>F</sub>Class 6 Other Nebraska Alternative Energy** (Scoresheet SF306) – Notebook should explore Nebraska an alternative energy source besides wind, water, and solar power. Include information on type of power chosen, infrastructure for distribution, what resources are needed to create this alternative resource, cost of production, and potential uses of bio-products.

### SET Woodworking Division 911

In this category 4-H'ers have the opportunity to create exhibits about varying levels of woodworking. In addition, participants can also create informational exhibits about their woodworking projects. Through involvement in this category 4-H'ers will be better educated about the topic and better their woodworking skills.

All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hwoodworking>.

#### Rules

1. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
2. Requirements: All articles exhibited must include a plan (with drawings or sketch or blueprints) stating dimensions and other critical instructions a builder would need to know how to build the project. Plans may include narrative instructions in addition to the dimension drawings and include any alternations to the original plan. Part of the score depends on how well the project matches the plans. If the plans are modified, the changes from the original need to be noted on the plans. All plans used for making the article must be securely attached and protected by a clear plastic cover.
3. 4-H'ers must be in Unit 3 or Unit 4 for the exhibit to be considered for State Fair. All projects must have appropriate finish.
4. If the project (i.e. picnic tables, wishing wells, swings, chairs, bridges, doghouses, etc.) is designed to be used outside, it will be displayed outside.
5. All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.



### MEASURING UP – UNIT 1

- Class 5 **First Woodworking Article:** Item made using skills learned in the Measuring Up project guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.
- Class 6 **Second Woodworking Article:** Item made using skills learned in the Measuring Up project guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.
- Class 7 **Third Woodworking Article:** Item made using skills learned in the Measuring Up project guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

### MAKING THE CUT – UNIT 2

- Class 8 **First Woodworking Article:** Item made using skills learned in the Making the Cut project guide. Examples include: birdhouse, footstool, napkin or letter holder. Items should be entered with construction plans.
- Class 9 **Second Woodworking Article:** Item made using skills learned in the Making the Cut project guide. Examples include: birdhouse, footstool, napkin or letter holder. Items should be entered with construction plans.
- Class 10 **Third Woodworking Article:** Item made using skills learned in the Making the Cut project guide. Examples include: birdhouse, footstool, napkin or letter holder. Items should be entered with construction plans.

### NAILING IT TOGETHER – UNIT 3

- <sup>S</sup><sub>F</sub>Class 1 **Woodworking Article:** (Scoresheet SF91) - Item should be made using either joints, hinges, dowels, or a dado joining made using skills learned in the Nailing It Together manual. Item is required to be appropriately finished. Examples include: coffee table or end table.
- <sup>S</sup><sub>F</sub>Class 3 **Recycled Woodworking Display:** (Scoresheet SF95) Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 3 manual. Exhibit must include the woodworking plan and a minimum one page report of how the engineering design process was used to develop the woodworking plan.
- Engineering Design Process
- 1) State the problem (Why did you need this item?)
  - 2) Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
  - 3) Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)
  - 4) Build the item (What was your woodworking plan, and what processes did you use to build your item?)
  - 5) Reason for article finish (What type of finish, how did you finish or why you choose this finish?)
  - 6) Evaluate (How does your item solve the original need?)
  - 7) Present results (How would you do this better next time?)
- <sup>S</sup><sub>F</sub>Class 4 **Composite Wood Project:** (Scoresheet SF96) - 60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.
- <sup>S</sup><sub>F</sub>Class 5 **Outdoor Wood Project made with Treated Wood:** (Scoresheet SF97) - Treated wood projects DO NOT have to have a finished coating. All plans and plan alternations



## 2022 Scotts Bluff County Fair 4-H Fair Book



must be attached to the article. Protect plans with a cover. If project is designed to be outside. Examples include: picnic tables, planters, outdoor furniture, etc.

### FINISHING UP – UNIT 4

<sup>S</sup><sub>F</sub>Class 6 **Woodworking Article:** (Scoresheet SF91) Item made using skills learned in the Finishing it Up Project. Examples include: dovetailing, making a pen using lathe, overlays, using a router, etc. Item is required to be appropriately finished.

<sup>S</sup><sub>F</sub>Class 8 **Recycled Woodworking Display:** (Scoresheet SF91) Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 manual. Exhibit must include the woodworking plan and a minimum one page report of how the design and engineering process was used to develop the woodworking plan.

- 1) State the problem (Why did you need this item?)
- 2) Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
- 3) Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)
- 4) Reason for article finish (What type of finish, how did you finish or why you choose this finish?)
- 5) Build the item (What was your woodworking plan, and what processes did you use to build your item?)
- 6) Evaluate (How does your item solve the original need?)  
Present results (How would you do this better next time?)

### Set Welding Division 920

This category helps 4-H'ers learn the basics of welding. In addition, 4-H'ers get the opportunity to present their knowledge on the topic and display what they have made. Involvement in SET Welding gives participants a first-hand experience in a skill that can be used for a lifetime.

**All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.**

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hwelding>.

#### Rules

1. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
2. All welds exhibited in class 1 or 2 must be mounted on a 12" high x 15" long display board of thickness not to exceed 3/8". Attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary. Each weld should be labeled with information stated 1) type of welding process (stick, MIG, TIG, Oxy-Acetylene, etc.) 2) kind of weld, 3) welder setting, 4) electrode/wire/rod size, and 5) electrode/wire/rod ID numbers. Attach a wire to display board so it can be hung like a picture frame. No picture frame hangers accepted
3. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
4. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
5. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations,



## 2022 Scotts Bluff County Fair 4-H Fair Book



Results: what you learned. All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.

6. If no plans are included with welding art, welding article, welding furniture or composite weld project item will be disqualified.
7. All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.

### ARC Welding

Learn to cut metal with an arc solder; Weld high carbon, spring steel and alloy steels; Weld horizontal, vertical and overhead positions.

URL: [https://4hcurriculum.unl.edu/index.php/main/program\\_project/143](https://4hcurriculum.unl.edu/index.php/main/program_project/143)

### Arcs and Sparks

- <sup>S</sup><sub>F</sub>Class 1 **Welding Joints**-(Scoresheet SF281) a display of one butt, one lap and one fillet weld.
- <sup>S</sup><sub>F</sub>Class 2 **Position Welds**-(Scoresheet SF281) a display showing three beads welded in the vertical down, horizontal and overhead positions.
- <sup>S</sup><sub>F</sub>Class 3 **Welding Art**-(Scoresheet SF283) – any art created using tack welds to hold the metal pieces together (examples include horseshoe projects). Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.
- <sup>S</sup><sub>F</sub>Class 4 **Welding Article**-(Scoresheet SF281) any shop article where welding is used in the construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.
- <sup>S</sup><sub>F</sub>Class 5 **Welding Furniture**-(Scoresheet SF282) any furniture with 75% welding is used in the construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.
- <sup>S</sup><sub>F</sub>Class 6 **Plasma Cutter/Welder Design**-(Scoresheet SF279) Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4-H members will create a notebook describing the design process to create the “artwork” to butt cut into the metal. In the notebook include: a) A photo (front and back) of the finished project,. b) Instructions on how the design was created (include software used), this allows for replication of the project. c) Lessons learned or improvements to the project. d) Steps to finish the project.
- Class 7 **Plasma Composite Weld Project**-(Scoresheet SF280) 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

### 4-H Welding Project Tips and Suggestions:

#### Class 1

1. All welds should be made with the same electrode/wire/rod size and number.
2. Welds should be made only on one side of metal so penetration can be judged.
3. Welds should be cleaned with chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.



## 2022 Scotts Bluff County Fair 4-H Fair Book



4. It is suggested that all welds be on the same size and thickness of metal. These pieces, referred to as coupons, should be 1.5 to 2 inches wide and 3.5 to 4 inches long. A good way to get this size is to buy new cold rolled strap iron and cut to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too cold at the bead start, just about right in the middle, and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full length bead.
5. Stick welding: Suggested coupon thickness - 1/4" if using 1/8" rod. Suggested rod-AC and DC straight or reverse polarity- first E-7014, second E-6013
6. MIG welding: Suggested coupon thickness - 1/4" if using .035 wire and 1/8" if using .023 wire
7. Oxy-Acetylene: Suggested coupon thickness - 1/8". Suggested rod- 1/8" mild steel rod

### Class 2

1. It is suggested that all welds be on same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4" x 4" or on individual coupons that are about 2" X 4" inch and -1/4" thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is, first E-6013, second E-7014 and E-6010 for DC reverse polarity only.
2. Welds should be cleaned with a chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.

### Class 3 & 4

All welds should be cleaned and protected from rust with paint or light oil. Plans are to be complete enough that if they were given to a welding shop, the item could be made without further instructions. Bill of materials should include a cost for all items used including steel, electrodes, paint, wheels, etc.